Operational Readiness Clearance Documentation

D0 L1 Calorimeter Upgrade Test Stand

D0 L1 Calorimeter Group

August 16, 2005

System Contact
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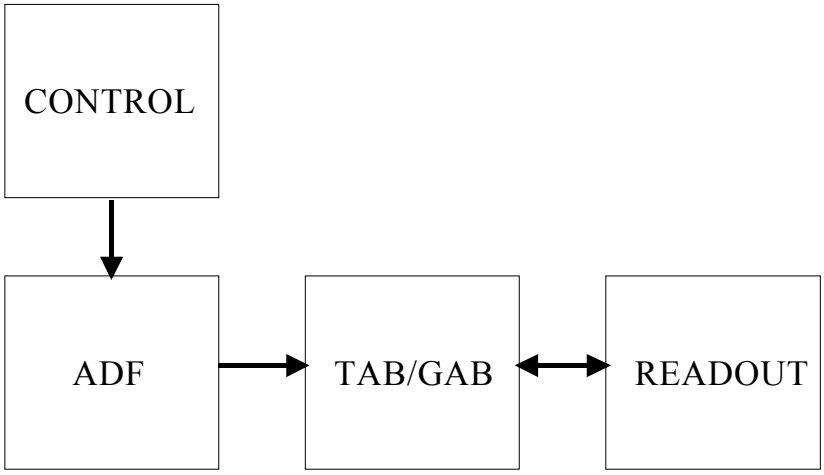
DAB X3100

Introduction

The D0 RunIIb L1 Calorimeter Upgrade system has been built on the sidewalk area of the D0 assembly building. This system is scheduled for installation on the first floor of movable counting house during the next Fermilab shutdown. The system consists of 3 types of crates, namely, the ADF (Analog Digital Filter) crate, TAB/GAB (Trigger Algorithm Board/Global Algorithm Board) crate, and a Control crate. We seek operational readiness clearance for unattended operation of this system.

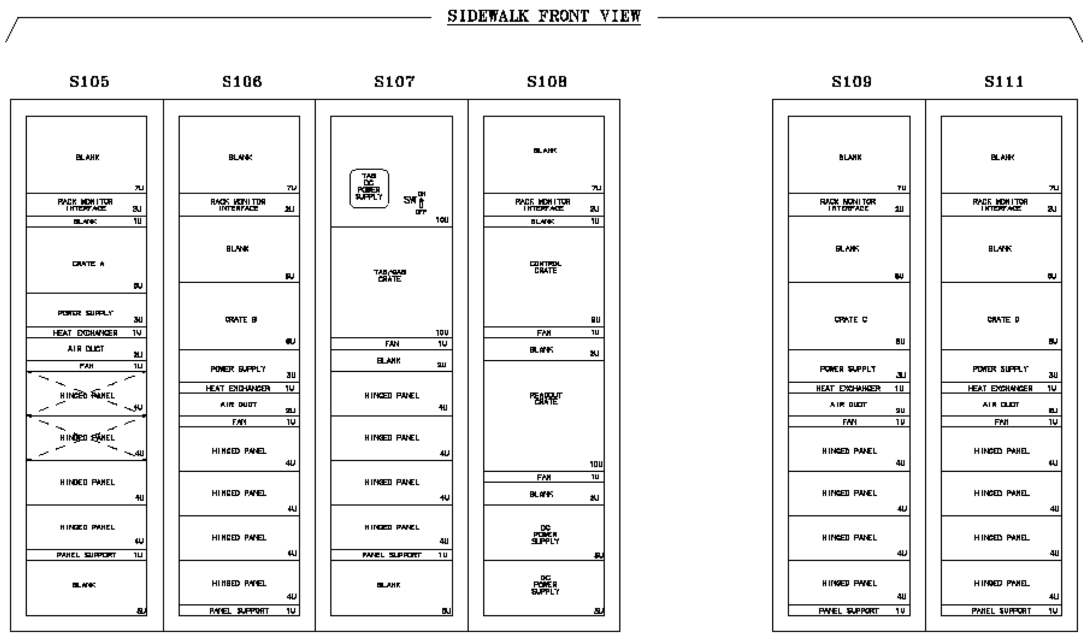
System Block Diagram



This block diagram represents a simplified version of the L1 Calorimeter system. The Control crate provides timing and control signals to the ADF crate. The output of the ADF is sent to the TAB/GAB crate for processing. Data is then sent from the TAB/GAB crate to a standard D0 Readout crate.

Rack Layout

The rack layout for this system is provided in drawing number 3823.133-MD-434272 (Sidewalk Layout) at http://d0server1.fnal.gov/users/bagby/www/L1_Cal/ORC_Docs/Sidewalk_434272.pdf . Racks S105-S108 contain the electronics for this review. Racks S109 and S111 are duplicates of rack S106.



REV	DESCRIPTION	DRAWN / APPROVED	DATE / DATE

UNLESS OTHERWISE SPECIFIED	ORIGINATOR J.FOGLESONG	05-MAY-2005
± ± ±	DRAWN J.CATALANELLO	05-MAY-2005
1. BREAK ALL SHARP EDGES MAX. 2. DO NOT SCALE DRAWING. 3. DIMENSIONS BASED UPON 4. MAX. ALL MACH. SURFACES √ 5. DRAWING UNITS:	CHECKED	
	APPROVED	
	USED ON	
	MATERIAL	

FERMI NATIONAL ACCELERATOR LABORATORY
UNITED STATES DEPARTMENT OF ENERGY

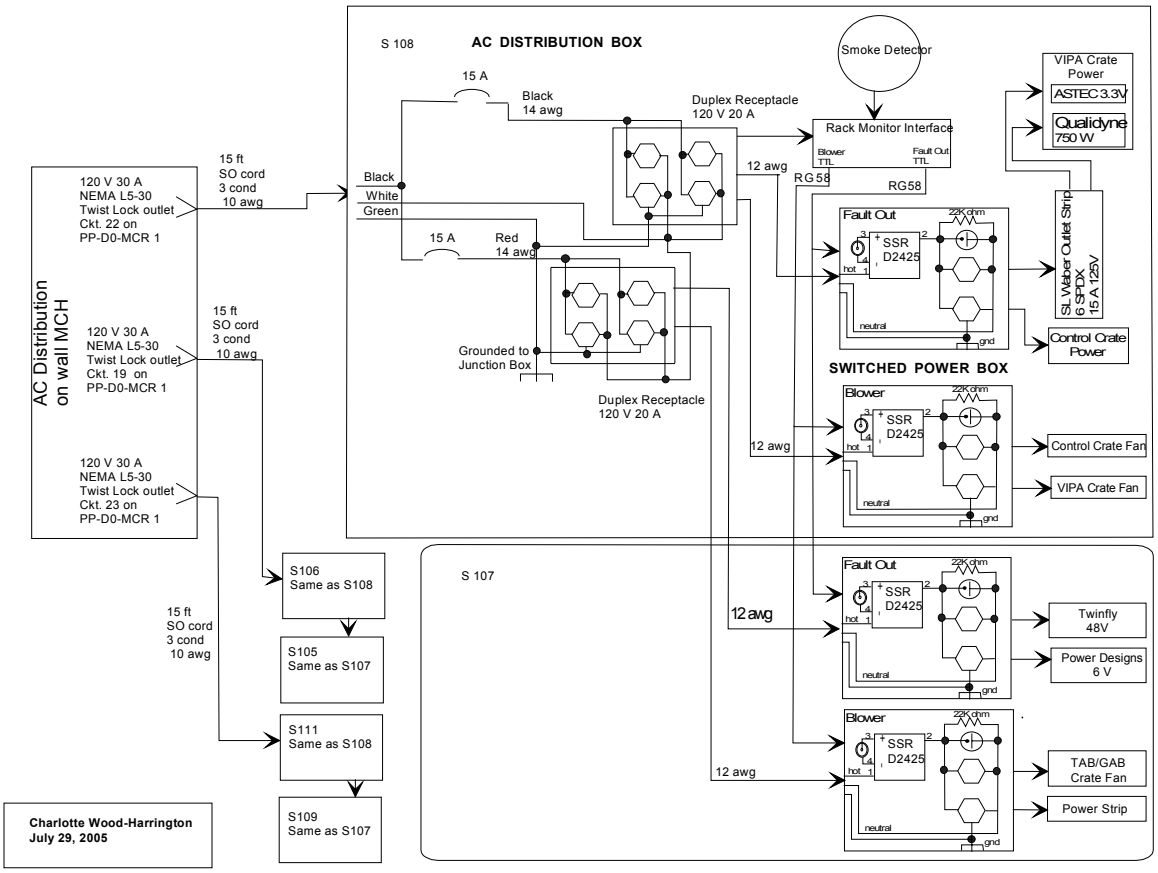
D0/D0 UPGRADE
L1 CAL TRIG RACK LAYOUT
SIDEWALK RACK TEST SETUP

SCALE	DRAWING NUMBER	SHEET	REV
	3823.133-MD-434272	1 OF 1	

CREATED WITH : IdeasI1NXSeries GROUP: PPD/MECHANICAL DEPARTMENT

AC Distribution – Smoke Detection

The following diagram illustrates the AC distribution and smoke detection system at the test stand. Three 120V/30A services are available to power three two-rack banks, S107-S108, S105-S106, and S109, S110. Each service is split into two 15A services via the AC Distribution box. Two Switched Power Boxes provide the smoke detection interlock, via a D0 standard RMI (Rack Monitor Interface) for each of the 15A services. The Fault Out output from the RMI disables the DC power supplies within a rack while the Blower output disables the fans.



DC Distribution

DC power distribution for each of the crates is described in the following sections. The ADF crate scheme is the production version and will be installed during the next shutdown. Power supplies used for the TAB/GAB and Control crates are temporary until similar commercial units arrive. The Readout crate uses standard D0 bulk type supplies.

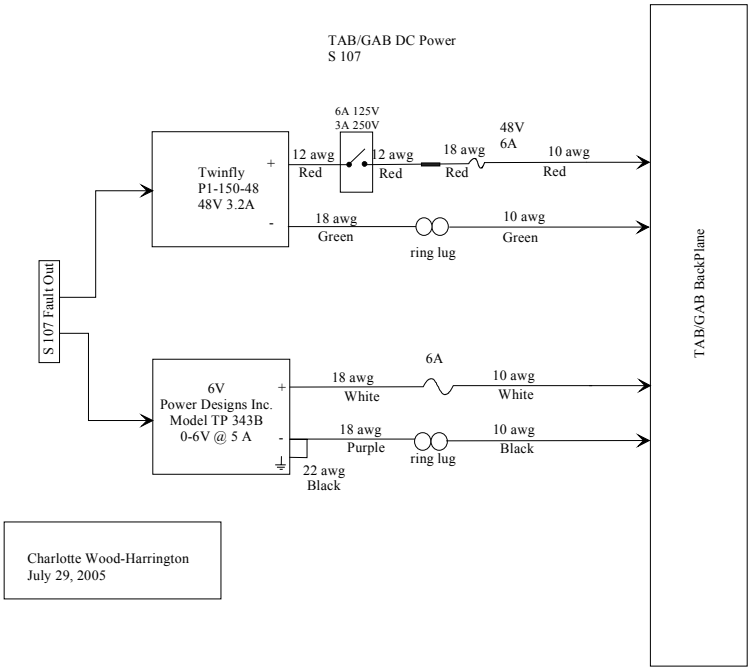
ADF Crate

The ADF power scheme utilizes a commercially available Wiener power supply-crate combination unit. The document describing this system can be found at

http://www/pa.msu.edu/hep/d0/ftp//run2b/l1cal/hardware/adf_2/cards_and_crates/safety_review_adf_crates.txt .

TAB/GAB Crate

The TAB/GAB crate is powered by a Twinfly 48V/3.2A and a Power Design 6V/5A supply. The supplies are located in rack S107. The diagram below illustrates the cable gauge and fusing used to connect the power to the TAB/GAB backplane. The highest gauge wire in the system is 18 AWG, capable of handling 12A.



The TAB/GAB crate power supply to backplane connection parameters are shown in the following table. The 6V/5A supply is connected to the TAB/GAB backplane via a

10AWG wire terminated with a ring lug and bolted in position over a .0924 in^2 copper surface area resulting in a current density of 63.7A/in^2. A 6 amp current was used in the calculation since the external fuse is rated at 6A. The 48V/3.2A power connection is made similarly. Both of these connections comply with the 1000A/in^2 limit per the Fermilab Electrical Standards guideline.

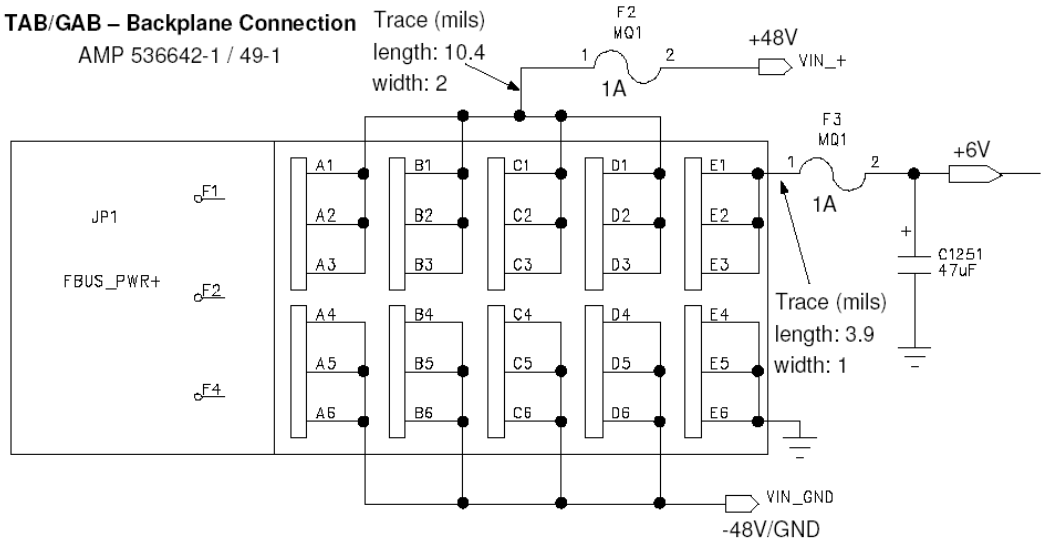
Power Distribution in the TAB/GAB Crate

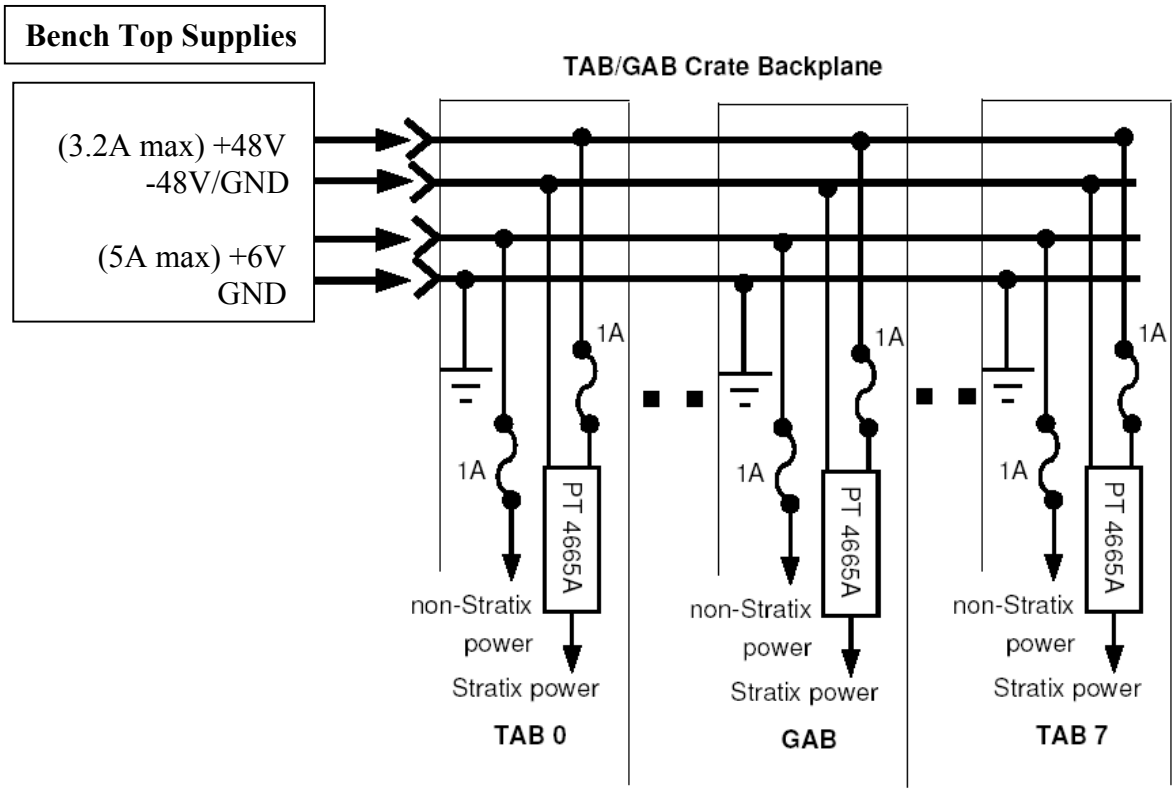
updated	05/24/05
inch/mil	0.001

+6 V					
From	**To**	**Element**	**Current (A)**	**Data**	
PS Cable	Lug	10 AWG	6.0 per cable		
Lug	Via	compression	63.7 / (in^2)	0.400	0.20 pad / hole diameter (in)
Plane	Connector (b'plane)	press fit – AMP 536642-1	813.9 / (in^2)	0.035	0.03 pad / hole diameter (in)
Connector (b'plane)	Connector (tab/gab)	AMP 536649-1	0.222222222 / pin	27	+6V power pins
Connector (tab/gab)	Fuse	trace		0.004	0.00 length / width (in)
TAB&GAB PS		LittleFuse	6		
TAB&GAB Card		LittleFuse	1		

+48 V					
From	**To**	**Element**	**I (A)**	**Data**	
PS Cable	Lug	10 AWG	6.0 per cable		
Lug	Via	compression	63.7 / (in^2)	0.400	0.20 pad / hole diameter (in)
Plane	Connector (b'plane)	press fit – AMP 536642-1	203.5 / (in^2)	0.035	0.03 hole/2oz via diameter (in)
Connector (b'plane)	Connector (tab/gab)	AMP 536649-1	0.055555556 / pin	108	+48V power pins
Connector (tab/gab)	Fuse	trace		0.010	0.00 length / width (in)
TAB&GAB PS		LittleFuse	6		2oz Cu = 2.69mil
TAB&GAB Card		LittleFuse	1		

The current ratings on the press fit pins interfacing the backplane to the TAB and GAB electronics boards also meet the guideline requirements. The 6V current density is .2A/pin while the 48V current density is .05A/pin, well below the conservative 1A/pin reference. As shown below, the TAB and GAB boards have 1A fuses to protect the card traces. The TAB/GAB crate electronics board fuse scheme is shown below.





Control Crate

The Control Crate power distribution utilizes a D0 Run1 ORC approved scheme used by the current L1 calorimeter electronics. This crate holds 2 Vertical Interconnect Master cards, an existing design by Fermilab, a commercially available BIT3, and a SCLD (Serial Command Link version D). A complete description of the system can be found at http://www/pa.msu.edu/hep/d0/ftp//run2b/l1cal/hardware/adf_2/cards_and_crates/safety_review_control_crate.txt .

Readout Crate

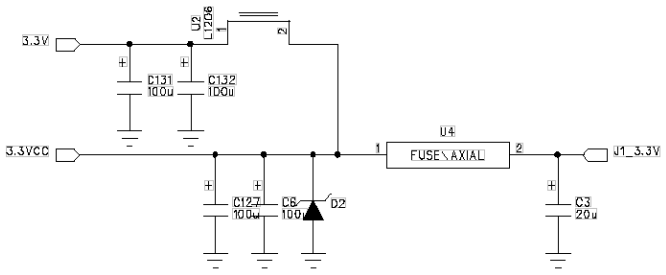
The Readout crate contains a BIT3, VTM (VME Transition Module), VRB (VME Readout Buffer), and a VRBC (VME Readout Buffer Controller). The BIT3 is a commercially available unit while the other three cards are the standard D0 readout crate components. A new design is temporarily housed in this crate, the VME/SCL card designed by Columbia.

The DC distribution for the VME/SCL card is shown below. 2A fuses are used to protect the board. The current density is .2A/pin for the 3.3V power source and .66A/pin for the 5V source.

VME/SCL Power Distribution

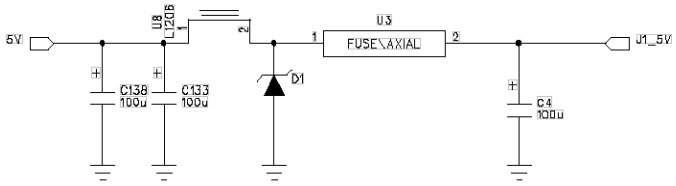
3.3V Power (Layer 5)

J1_3.3V Pins (10):
140,142,144,146,148,150,152,154,156,158

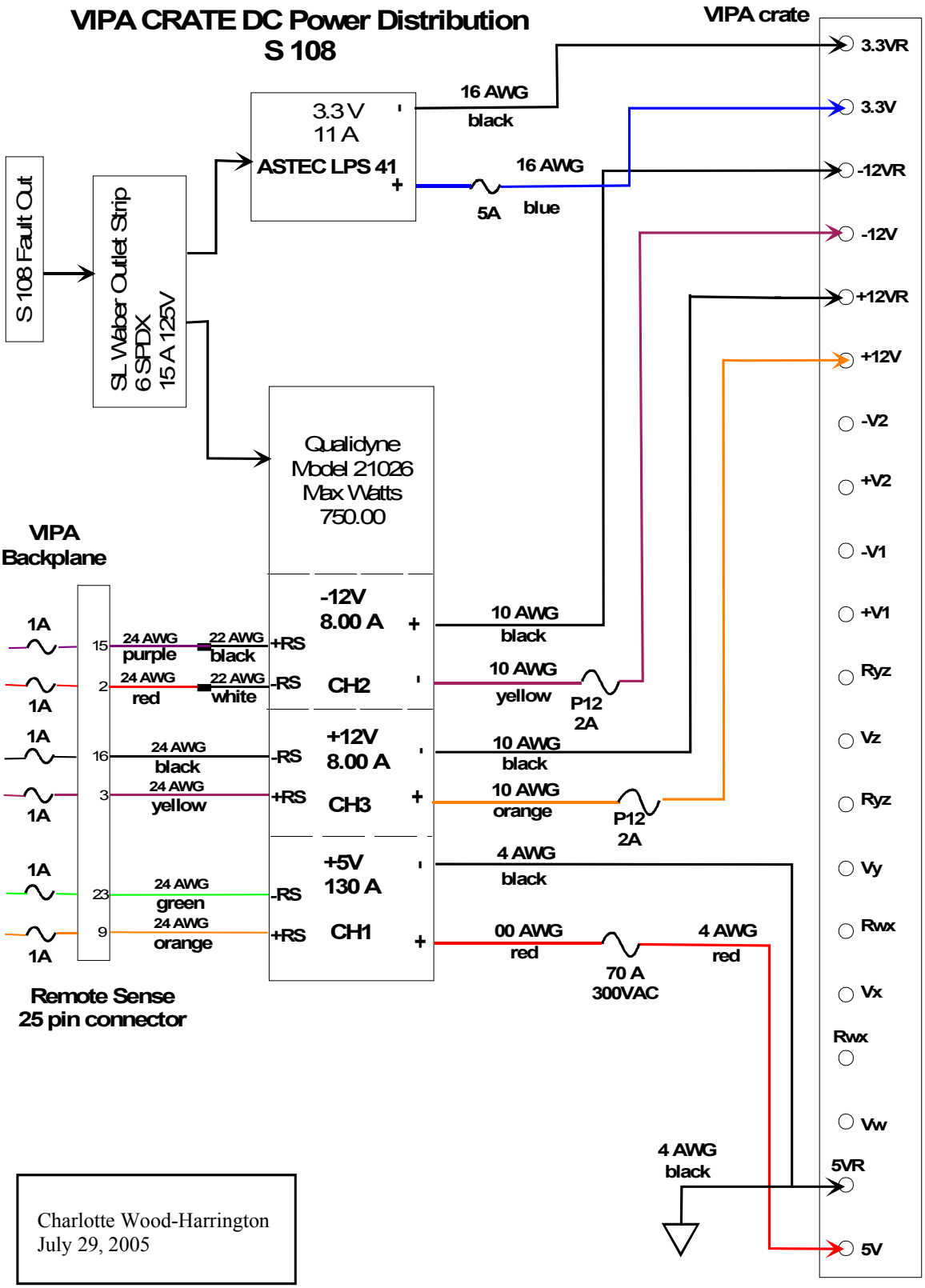


5V Power (Layer 4)

J1_5V Pins (3):
64,96,128



The diagram below shows the DC distribution for the readout VIPA crate. It includes the additional 3.3V/11A supply required by the VME/SCL card. The 16AWG cable connecting the 3.3V/11A supply to the VIPA backplane can accommodate 12A therefore an in-line fuse is not required. The +/- 12V and +5V supply sense leads are protected by 1A overcurrent protection devices from Tyco, part number 050. The specification document for this part can be found at http://d0server1.fnal.gov/users/bagby/www/L1_Cal/ORC_Docs/SMD050.pdf


VIPA CRATE DC Power Distribution
S 108
VIPA crate
3.3VR
3.3V
-12VR
-12V
+12VR
+12V
-V2
+V2
-V1
+V1
Ryz
Vz
Ryz
Vy
Rwx
Vx
Rwx
Vw
5VR
5V
3.3 V
11 A
ASTEC LPS 41
16 AWG
black
16 AWG
blue
5A
S 108 Fault Out
SL Waber Outlet Strip
6 SPDX
15 A 125V
Qualidyne
Model 21026
Max Watts
750.00
VIPA
Backplane
-12V
8.00 A
CH2
+12V
8.00 A
CH3
+5V
130 A
CH1
10 AWG
black
10 AWG
yellow
P12
2A
10 AWG
black
10 AWG
orange
P12
2A
4 AWG
black
00 AWG
red
70 A
300VAC
4 AWG
red
4 AWG
black
1A
15
24 AWG
purple
22 AWG
black
+RS
2
24 AWG
red
22 AWG
white
-RS
16
24 AWG
black
-RS
3
24 AWG
yellow
+RS
23
24 AWG
green
-RS
9
24 AWG
orange
+RS
Remote Sense
25 pin connector
Charlotte Wood-Harrington
July 29, 2005

Cooling

The TAB/GAB, Control, and Readout crates each have a fan pack mounted below the crate to provide cooling to the electronics. A fan pack module is part of the Wiener power-crate combination unit.